Ben-Gurion University of the Negev
Blaustein Institutes for Desert Research
The Swiss Institute for Dryland Environmental and Energy Research
Alexandre Yersin Department of Solar Energy and Environmental Physics

Title:

Dynamics and Statics of Three-Dimensional Jamming Percolation

Speaker:

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Abstract:
Kinetically-constrained models provide a promising framework for describing the cooperatively slow relaxation dynamics in diverse systems such as glass-forming liquids, colloidal suspensions and granular materials. These models are defined with non-interacting binary state variables 0,1 on each site of a periodic lattice, either such that a site can flip its state (0 <-> 1 , like in an Ising model) or such that two neighboring sites can exchange their states (10 <-> 01 , like motion of a particle to a neighboring vacant site in a lattice gas), but that such transitions require a certain local kinetic constraint to hold.

By analyzing initial configurations in kinetically-constrained models we theoretically predict their resultant dynamics. We employ an iterative culling procedure in order to find the number of particles blocking each particle, and then relate that to the persistence time, namely the time of first motion (lattice gas) or spin flip (Ising model). The second aspect of our dynamical predictions focuses on a three dimensional model, for which we demonstrate that jamming and caging are two decoupled physical phenomena. At a first critical density a finite fraction of the particles in the system are permanently jammed and do not move, while only at a higher critical density, do the mobile particles become caged and self-diffusivity vanishes.

Tuesday, January 24, 2017, 11:00
Lecture room, Physics Building (ground floor)